

## CLAIMS

What is claimed is:

- 1 1. A method of operation within an integrated circuit device, the method comprising:  
2 generating an index based on a search value;  
3 determining whether the search value matches a data value stored at a memory  
4 location indicated by the index; and  
5 outputting, from the integrated circuit device, the index and an indication of  
6 whether the search value matches the data value.
- 1 2. The method of claim 1 wherein generating the index based on the search value  
2 comprises selecting a portion of the search value, and generating the index based on  
3 the selected portion of the search value.
- 1 3. The method of claim 2 wherein selecting the portion of the search value comprises  
2 selecting the portion of the search value in accordance with a configuration value  
3 stored within the integrated circuit device.
- 1 4. The method of claim 1 wherein generating an index based on the search value  
2 comprises:  
3 assembling dispersed fields of bits within the search value to form a search key; and  
4 generating the index based on the search key.
- 1 5. The method of claim 4 further comprising masking selected bits within the search  
2 key prior to generating the index.
- 1 6. The method of claim 5 wherein masking selected bits within the search key

2 comprises masking bits within the search key in accordance with a configuration  
3 value within the integrated circuit device.

1 7. The method of claim 4 wherein assembling dispersed fields of bits within the search  
2 value to form the search key comprises assembling the dispersed fields of bits into a  
3 contiguous set of bits in accordance with a configuration value within the integrated  
4 circuit device.

1 8. The method of claim 7 wherein the configuration value specifies a data format of  
2 the search value.

1 9. The method of claim 1 wherein generating the index based on the search value  
2 comprises generating a hash index based on the search value, the hash index having  
3 fewer constituent bits than the search value.

1 10. The method of claim 9 wherein generating the hash index comprises generating a  
2 cyclic redundancy check (CRC) value.

1 11. The method of claim 1 wherein determining whether the search value matches the  
2 data value comprises comparing the search value with the data value to generate a  
3 match signal that indicates whether the search value matches the data value.

1 12. The method of claim 11 wherein outputting the indication of whether the search  
2 value matches the data value comprises outputting the match signal.

1 13. The method of claim 11 wherein comparing the search value with the data value  
2 comprises comparing a selected portion of the search value with a selected portion

3 of the data value, the selected portions of the search value and data value being  
4 indicated by a mask value.

1 14. The method of claim 13 further comprising retrieving the mask value from the  
2 memory location indicated by the index.

1 15. The method of claim 13 further comprising decoding an encoded value to generate  
2 the mask value.

1 16. The method of claim 15 further comprising retrieving the encoded value from the  
2 memory location indicated by the index.

1 17. The method of claim 11 wherein comparing the search value with the data value  
2 comprises determining whether the search value is greater than the data value and  
3 wherein generating the match signal that indicates whether the search value  
4 matches the data value comprises generating a match signal to indicate that the  
5 search value matches the data value if the search value is not greater than the data  
6 value.

1 18. The method of claim 11 wherein comparing the search value with the data value  
2 comprises determining whether the search value is less than the data value and  
3 wherein generating the match signal that indicates whether the search value  
4 matches the data value comprises generating a match signal to indicate that the  
5 search value matches the data value if the search value is not less than the data  
6 value.

1 19. The method of claim 11 wherein comparing the search value with the data value

comprises performing either a range comparison or a match comparison according to a configuration value within the integrated circuit device, and wherein performing a range comparison comprises determining whether the search value is greater than the data value.

20. The method of claim 1 wherein generating an index based on a search value comprises:  
generating a plurality of hash values based on the search value, each hash value having fewer constituent bits than the search value; and  
selecting one of the hash values to be the index.

21. The method of claim 20 wherein selecting one of the hash values to be the index comprises selecting the one of the hash values in accordance with a configuration value within the integrated circuit device.

22. The method of claim 1 further comprising:  
retrieving a priority value from the memory location indicated by the index; and  
outputting the priority value from the integrated circuit device.

23. A method of operation within an integrated circuit device, the method comprising:  
receiving a search value;  
generating an index based on a selected portion of the search value; and  
determining whether the search value matches a data value stored at a memory location indicated by the index.

24. The method of claim 23 further comprising selecting the selected portion of the

2 search value in accordance with a configuration value stored within the integrated  
3 circuit device.

1 25. The method of claim 23 wherein generating an index based on a selected portion of  
2 the search value comprises:  
3 assembling dispersed fields of bits within the search value to form a search key; and  
4 generating the index based on the search key.

1 26. The method of claim 25 further comprising masking selected bits within the search  
2 key prior to generating the index.

1 27. The method of claim 26 wherein masking selected bits within the search key  
2 comprises masking bits within the search key in accordance with a configuration  
3 value within the integrated circuit device.

1 28. The method of claim 25 wherein assembling dispersed fields of bits within the  
2 search value to form the search key comprises assembling the dispersed fields of  
3 bits into a contiguous set of bits in accordance with a configuration value within the  
4 integrated circuit device.

1 29. The method of claim 23 wherein generating the index based on a selected portion of  
2 the search value comprises generating a hash index based on the selected portion of  
3 the search value, the hash index having fewer constituent bits than the search value.

1 30. The method of claim 29 wherein generating the hash index comprises generating a  
2 cyclic redundancy check (CRC) value.

1 31. A method of operation within an integrated circuit device, the method comprising:  
2 generating an index based on a search value; and  
3 generating an indication of whether a first portion of the search value matches a  
4 selected portion of a data value stored at a memory location indicated by the  
5 index.

1 32. The method of claim 31 wherein generating the index based on the search value  
2 comprises selecting a portion of the index, and generating the index based on the  
3 selected portion of the index.

1 33. The method of claim 32 wherein selecting the portion of the index comprises  
2 selecting the portion of the index in accordance with a configuration value stored  
3 within the integrated circuit device.

1 34. The method of claim 31 wherein generating an index based on the search value  
2 comprises:  
3 assembling dispersed fields of bits within the search value to form a search key; and  
4 generating the index based on the search key.

1 35. The method of claim 4 further comprising masking selected bits within the search  
2 key prior to generating the index, the selected bits being selected in accordance with  
3 a configuration value within the integrated circuit device.

1 36. The method of claim 31 wherein generating an indication of whether a first portion  
2 of the search value matches a selected portion of a data value stored at a memory  
3 location indicated by the index comprises:

4 retrieving the data value from the memory location indicated by the index; and  
5 comparing the first portion of the search value with the selected portion of the data  
6 value to generate a match signal that indicates whether the search value  
7 matches the data value.

1 37. The method of claim 36 further comprising retrieving mask information from the  
2 memory location indicated by the index, the mask information indicating the  
3 selected portion of the data value.

1 38. The method of claim 37 further comprising decoding an encoded value included  
2 within the mask information to generate a decoded mask value, the mask value  
3 indicating the selected portion of the data value.

1 39. A method of operation within an integrated circuit device the method comprising:  
2 generating a search index based on a search value; and  
3 identifying, within a content addressable memory (CAM), one of a plurality of  
4 stored indices that matches the search index; and  
5 determining whether the search value matches a data value stored at a first location  
6 within a data memory, the first location corresponding to a location of the one  
7 of the plurality of indices.

1 40. The method of claim 39 wherein generating the search index based on the search  
2 value comprises selecting a portion of the search value, and generating the search  
3 index based on the selected portion of the search value.

1 41. The method of claim 40 wherein selecting the portion of the search value comprises

2 selecting the portion of the search value in accordance with a configuration value  
3 within the integrated circuit device.

1 42. The method of claim 39 wherein generating the search index based on the search  
2 value comprises generating a search index having fewer constituent bits than the  
3 search value.

1 43. The method of claim 39 wherein generating the search index comprises generating  
2 a cyclic redundancy check (CRC) value.

1 44. The method of claim 39 wherein identifying, within the CAM, one of a plurality of  
2 stored indices that matches the search index comprises comparing the search index  
3 with each of the plurality of stored indices.

1 45. The method of claim 44 wherein comparing the search index with each of the  
2 plurality of stored indices comprises simultaneously comparing the search index  
3 with each of the plurality of stored indices.

1 <sup>46</sup>  
2 ~~45.~~ The method of claim 44 wherein identifying one of a plurality of stored indices that  
3 matches the search index further comprises generating a plurality of match signals,  
4 each match signal indicating whether a respective one of the stored indices matches  
the search index.

1 <sup>47</sup>  
2 ~~46.~~ The method of claim 39 wherein determining whether the search value matches a  
3 data value stored at a first location within a data memory comprises:  
4 retrieving the data value from the first location within the memory; and  
comparing the search value with the data value.



48  
1 47. The method of claim 46 wherein retrieving the data value from the first location  
2 within the memory comprises:  
3 generating a row address indication that corresponds to the one of the plurality of  
4 stored indices that matches the search index; and  
5 retrieving the data value from a location within the memory indicated by the row  
6 address indication.

49  
1 48. The method of claim 47 wherein generating the row address indication comprises  
2 generating a plurality of match signals that each indicate whether a respective one  
3 of the stored indices matches the search index.

50  
1 49. The method of claim 48 wherein generating the row address indication further  
2 comprises encoding the plurality of match signals into a row address.

51  
1 50. The method of claim 49 wherein encoding the plurality of match signals into a row  
2 address comprises retrieving the row address from a lookup table storage location  
3 indicated by the plurality of match signals.

52  
1 51. A method of operation within an integrated circuit device, the method comprising:  
2 converting a search value into a search index having fewer constituent bits than the  
3 search value;  
4 identifying, within a content addressable memory (CAM), one of a plurality of  
5 stored indices that matches the search index; and  
6 outputting a data value from a first location within a data memory, the first location  
7 corresponding to a location within the CAM of the one of the plurality of

8 indices.

1 <sup>51</sup>~~52~~. The method of claim <sup>52</sup>~~51~~ further comprising determining whether the search value  
2 matches the data value.

1 <sup>54</sup>~~53~~. The method of claim <sup>53</sup>~~52~~ further comprising generating a match signal that indicates  
2 whether the search value matches the data value.

1 <sup>55</sup>~~54~~. The method of claim <sup>52</sup>~~51~~ wherein converting a search value into a search index  
2 comprises converting a selected portion of the search value into a search index.

1 <sup>56</sup>~~55~~. The method of claim <sup>52</sup>~~51~~ wherein converting a search value into a search index  
2 comprises generating a hash index based on the search value.

1 <sup>57</sup>~~56~~. The method of claim <sup>56</sup>~~55~~ wherein generating a hash index comprises generating a  
2 cyclic redundancy check (CRC) value.

1 <sup>58</sup>~~57~~. The method of claim <sup>52</sup>~~51~~ wherein identifying, within the CAM, one of a plurality of  
2 stored indices that matches the search index comprises comparing the search index  
3 with each of the plurality of stored indices.

1 <sup>59</sup>~~58~~. The method of claim <sup>58</sup>~~57~~ wherein comparing the search index with each of the  
2 plurality of stored indices comprises simultaneously comparing the search index  
3 with each of the plurality of stored indices.

1 <sup>60</sup>~~59~~. The method of claim <sup>58</sup>~~57~~ wherein identifying, within a content addressable memory  
2 (CAM), one of a plurality of stored indices that matches the search index further

3 comprises generating a plurality of match signals, each match signal indicating  
4 whether a respective one of the stored indices matches the search index.

1 <sup>61</sup>~~60~~. The method of claim <sup>52</sup>~~51~~ wherein outputting the data value from the first location  
2 within the data memory comprises:  
3 generating a row address indication that corresponds to the one of the plurality of  
4 stored indices that matches the search index; and  
5 retrieving the data value from a location within the data memory indicated by the  
6 row address indication.

1 <sup>62</sup>~~61~~. The method of claim <sup>61</sup>~~60~~ wherein generating the row address indication comprises  
2 generating a plurality of match signals that each indicate whether a respective one  
3 of the stored indices matches the search index.

1 <sup>63</sup>~~62~~. The method of claim <sup>62</sup>~~61~~ wherein generating the row address indication further  
2 comprises encoding the plurality of match signals into a row address.

1 <sup>64</sup>~~63~~. A method of operation within an integrated circuit device, the method comprising:  
2 generating a plurality of indices based on a search value;  
3 selecting, according to a select value, one of the plurality of indices; and  
4 determining whether the search value matches a data value stored at a memory  
5 location indicated by the one of the plurality of indices.

1 <sup>65</sup>~~64~~. The method of claim <sup>64</sup>~~63~~ wherein generating a plurality of indices based on a search  
2 value comprises selecting a portion of the search value, and generating each of the  
3 plurality of indices based on the selected portion of the search value.

1 <sup>68</sup> 65. The method of claim <sup>69</sup> ~~64~~ wherein selecting the portion of the search value comprises  
2 selecting the portion of the search value in accordance with a configuration value  
3 stored within the integrated circuit device.

67  
66. The method of claim 64 wherein generating each of the plurality of indices based  
on the search value comprises:  
assembling dispersed fields of bits within the search value to form a search key; and  
generating each of the plurality of indices based on the search key.

1 <sup>68</sup>~~67~~. The method of claim <sup>67</sup>~~66~~ further comprising masking selected bits within the search  
2 key prior to generating the plurality of indices.

1 <sup>69</sup>68. The method of claim <sup>68</sup>67 wherein masking selected bits within the search key  
2 comprises masking bits within the search key in accordance with a configuration  
3 value within the integrated circuit device.

1 <sup>70</sup>~~69~~. The method of claim <sup>64</sup>~~63~~ wherein selecting one of the plurality of indices comprises  
2 selecting one of the plurality of indices in accordance with a configuration value  
3 within the integrated circuit device.

1 <sup>71</sup>~~70~~. The method of claim <sup>14</sup>~~63~~ wherein generating a plurality of indices based on a search  
2 value comprises generating a plurality of different indices based on the search  
3 value.

1 <sup>71</sup> 71. The method of claim ~~70~~<sup>71</sup> wherein generating a plurality of plurality of different  
2 indices comprises inputting at least a portion of the search value to a plurality of

3 hash function circuits, each hash function circuit being adapted to generate a  
4 respective hash index based on a hash function that is different from the others of  
5 the hash function circuits.

73  
1 72. The method of claim 63 wherein determining whether the search value matches a  
2 data value stored at a memory location indicated by the one of the plurality of  
3 indices comprises comparing the search value with the data value and generating a  
4 match signal that indicates whether the search value matches the data value.

74  
1 73. The method of claim 72 wherein comparing the search value with the data value  
2 comprises comparing a selected portion of the search value with a selected portion  
3 of the data value, the selected portions of the search value and data value being  
4 indicated by a mask value.

75  
1 74. The method of claim 73 further comprising retrieving the mask value from the  
2 memory location indicated by the one of the plurality of indices.

76  
1 75. A method of operation within an integrated circuit device, the method comprising:  
2 generating a plurality of indices based on a search value;  
3 retrieving a plurality of data values from a plurality of memories, each data value  
4 being retrieved from a respective one of the memories at a location indicated  
5 by a respective one of the plurality of indices;  
6 comparing the search value to each of the plurality of data values to identify one of  
7 the data values that matches the search value; and  
8 generating a value that identifies the respective one of the memories from which the  
9 one of the data values that matches the search value was retrieved.

1 <sup>77</sup>  
~~76~~. The method of claim ~~75~~ <sup>77</sup> wherein generating a plurality of indices based on a search  
2 value comprises generating a plurality of hash indices based on at least a portion of  
3 the search value, each of the hash indices having fewer constituent bits than the  
4 search value.

1 <sup>76</sup>  
~~77~~. The method of claim ~~76~~ <sup>77</sup> wherein generating the plurality of hash indices comprises  
2 generating a plurality of cyclic redundancy check (CRC) values.

1 <sup>75</sup>  
~~78~~. The method of claim ~~75~~ <sup>77</sup> wherein comparing the search value to each of the plurality  
2 of data values comprises comparing the search value with a selected portion of each  
3 of the data values, the selected portion of each of the data values being indicated by  
4 a respective mask value.

1 <sup>80</sup>  
~~79~~. The method of claim ~~78~~ <sup>79</sup> further comprising retrieving the respective mask value  
2 from a respective one of the memories at a location indicated by a respective one of  
3 the plurality of indices.

4 <sup>81</sup>  
~~80~~. The method of claim ~~79~~ <sup>77</sup> wherein retrieving a plurality of data values from a  
5 plurality of memories comprises retrieving a first data value from a first one of the  
6 plurality of memories, and retrieving a second data value from a second one of the  
7 plurality of memories, the second one of the plurality of memories having a  
8 different storage capacity than the first one of the plurality of memories.

1 <sup>82</sup>  
~~81~~. A method of operation within an integrated circuit device, the method comprising:  
2 receiving a search value and a corresponding search code;  
3 comparing the search code to a plurality of configuration values, each of the

4 configuration values corresponding to a respective one of a plurality of data  
5 memories within the integrated circuit device;  
6 generating a plurality of indices based on the search value;  
7 retrieving a plurality of data values from the plurality of data memories, each data  
8 value being retrieved from a respective one of the data memories at a location  
9 indicated by a respective one of the indices; and  
10 generating, for each of the plurality of data memories, a respective match signal  
11 having a first state if the search value matches the data value retrieved from  
12 the data memory and if the search code matches the configuration value that  
13 corresponds to the data memory.

83/ 1 82. The method of claim 82 wherein receiving a search code comprises receiving a  
2 search code that indicates a formatting of the corresponding search value.

84/ 1 83. The method of claim 82 wherein receiving a search code comprises receiving a  
2 search code that indicates positions of maskable bits within the corresponding  
3 search value.

85/ 1 84. The method of claim 82 wherein generating a match signal having a first state if the  
2 search value matches the data value retrieved from the data memory and if the  
3 search code matches the configuration value that corresponds to the data memory  
4 comprises:  
5 comparing a selected portion of the search value and a selected portion of the data  
6 value; and  
7 generating a match signal having a first state if the selected portion of the search  
8 signal matches the selected portion of the data value and if the search code

9 matches the configuration value.

1 <sup>86</sup>~~85~~. The method of claim <sup>82</sup>~~81~~ further comprising retrieving a plurality of priority values  
2 from the plurality of data memories, each priority value being retrieved from a  
3 respective one of the data memories at a location indicated by a respective one of  
4 the indices.

1 <sup>87</sup>~~86~~. The method of claim <sup>82</sup>~~81~~ further comprising generating an identifier based on the  
2 plurality of priority values and the match signals generated for the plurality of data  
3 memories, the identifier indicating one of the plurality of data memories.

1 <sup>88</sup>~~87~~. The method of claim <sup>87</sup>~~86~~ wherein generating an identifier that indicates one of the  
2 plurality of data memories comprises generating an identifier that indicates a data  
3 memory of the plurality of data memories that contains a highest priority one of the  
4 plurality of priority values and for which the respective match signal has the first  
5 state.

1 <sup>89</sup>~~88~~. A method of operation within an integrated circuit device, the method comprising:  
2 generating an index based on an input value;  
3 retrieving a first value from a location, indicated by the index, within a first  
4 memory;  
5 comparing the first value to the input value to generate a first match signal that  
6 indicates whether the input value matches the first value; and  
7 comparing the input value simultaneously to each of a plurality of values stored in a  
8 second memory to generate a second match signal that indicates whether the  
9 input value matches one of the plurality of values stored in the second



1 <sup>90</sup>~~89~~. The method of claim <sup>89</sup>~~88~~ wherein comparing the input value simultaneously to each  
2 of a plurality of values stored in the second memory comprises comparing the input  
3 value to a plurality of values stored in an array of content addressable memory  
4 (CAM) cells, each CAM cell including a storage element and a compare circuit.

1 <sup>91</sup>~~90~~. The method of claim <sup>89</sup>~~88~~ further comprising:  
2 outputting a first priority value from the location within the first memory;  
3 outputting a second priority value from the second memory; and  
4 comparing the first priority value and the second priority value in accordance with  
5 the states of the first and second match signals to determine a highest priority  
6 one of the priority values.

1 <sup>92</sup>~~91~~. The method of claim <sup>91</sup>~~90~~ wherein comparing the first priority value and the second  
2 priority value in accordance with the states of the first and second match signals to  
3 determine a highest priority one of the priority values comprises determining the  
4 first priority value to be the highest priority value if the first match signal is asserted  
5 and the first priority value indicates a higher priority than the second priority value.

1 <sup>93</sup>~~92~~. The method of claim <sup>89</sup>~~88~~ wherein generating an index based on an input value  
2 comprises generating an index having fewer constituent bits than the input value.

1 <sup>94</sup>~~93~~. The method of claim <sup>89</sup>~~88~~ wherein generating the index based on the search value  
2 comprises selecting a portion of the search value, and generating the index based on  
3 the selected portion of the search value.

1 <sup>95</sup>  
~~94~~. The method of claim ~~93~~<sup>94</sup> wherein selecting the portion of the search value comprises  
2 selecting the portion of the search value in accordance with a configuration value  
3 within the integrated circuit device.

1 <sup>96</sup>  
~~95~~. The method of claim ~~93~~<sup>94</sup> wherein generating an index based on the search value  
2 comprises:  
3 assembling dispersed fields of bits within the search value to form a search key; and  
4 generating the index based on the search key.

1 <sup>97</sup>  
~~96~~. The method of claim ~~95~~<sup>96</sup> further comprising masking selected bits within the search  
2 key prior to generating the index.

1 <sup>98</sup>  
~~97~~. The method of claim ~~96~~<sup>97</sup> wherein masking selected bits within the search key  
2 comprises masking bits within the search key in accordance with a configuration  
3 value within the integrated circuit device.

1 <sup>99</sup>  
~~98~~. A method of operation within an integrated circuit device, the method comprising:  
2 generating a plurality of priority values in response to a first instruction, each  
3 priority value indicating a storage capacity of a respective one of a plurality of  
4 circuit blocks; and  
5 generating, based on the priority values, a block identifier that identifies one of the  
6 circuit blocks.

1 <sup>100</sup>  
~~99~~. The method of claim ~~97~~<sup>98 99</sup> wherein generating the block identifier based on the  
2 priority values comprises generating a block identifier that identifies a least filled  
3 one of the plurality of circuit blocks.

101  
1 100. The method of claim 99 wherein generating the block identifier based on the  
2 priority values comprises generating a block identifier that identifies a most filled  
3 one of the plurality of circuit blocks.

102  
1 101. The method of claim 99 further comprising storing, in response to generation of the  
2 block identifier, a data value in the one of the plurality of circuit blocks identified  
3 by the block identifier.

103  
1 102. A method of operation within an integrated circuit device, the method comprising:  
2 generating a plurality of indices based on a search value; and  
3 for each of a plurality of circuit blocks within the integrated circuit device:  
4 selecting one of the indices;  
5 retrieving a data value from a first storage location within the circuit block,  
6 the first storage location being indicated by the one of the indices; and  
7 determining whether the data value matches the search value.

104  
1 103. The method of claim 102 wherein generating the plurality of indices based on the  
2 search value comprises generating a plurality of indices that each have fewer  
3 constituent bits than the search value.

105  
1 104. The method of claim 103 wherein generating the plurality of indices based on the  
2 search value comprises generating each of the plurality of indices based on a  
3 selected portion of the search value.

106  
1 105. The method of claim 103 wherein selecting one of the indices comprises selecting  
2 one of the indices in accordance with a configuration value within the integrated

3 circuit.

1 <sup>107</sup>~~106~~. The method of claim <sup>103</sup>~~102~~ wherein determining whether the data value matches the  
2 search value comprises comparing a selected portion of the data value with a  
3 selected portion of the mask value.

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